Battelle/BAI Platform Partnership with The University of Iowa

• Key to the success of the Battelle/BAI Platform investments will be the integration of Battelle/BAI Platforms with the Strategic Plan for Research at Iowa's major research universities.

• At The University of Iowa, the Battelle/BAI Platforms are fully integrated with one of our key major initiatives to create a **NIH funded Clinical Translational Research Center.**

• A major goal of The University of Iowa **NIH Clinical Translational Research Center** is:

- to stimulate the development of new entrepreneurial ventures between the University, biotechnology companies and communities across the State of Iowa

Battelle/BAI Platform Partnership with University of Iowa

Battelle/BAI Platforms The University of Iowa is leading with industry partners:

- **Drug Discovery and Development**
- **BioMedical Imaging**
- **Genomic Medicine**
- **Biodefense/Biosecurity (co-leaders with ISU)**

Battelle/BAI Platform: Drug Discovery and Development

Platform Co-Chairs

Chris Nelson, Ph.D.
Worldwide President
Kemin Industries

Jordan Cohen, Ph.D.
Dean, College of Pharmacy
University of Iowa

- This platform will create a public/private research and development organization to work with industrial and university scientists to stimulate new product development and promote IP transfer for the benefit of Iowa in the human health field.

Battelle/BAI Platform: Drug Discovery and Development

Potential Projects:

Title: Diagnostics and Therapeutics Platform for Age-related Macular Degeneration

Partners

Optherion, Inc., David Scheer, Scheer and Company**;** Advanced Vision Therapies, Inc., Asper Ophthalmics, Pfizer Global Research & Development, The University of Iowa

Outcome: Estimates place the potential annual treatment/prevention **market in excess of $4 billion**.

Title: Molecularly Targeted Radiopeptide Therapy for Cancer

Partners: BioSynthema, Neoprobe, NewLink Genetics, The University of Iowa Comprehensive Cancer Center

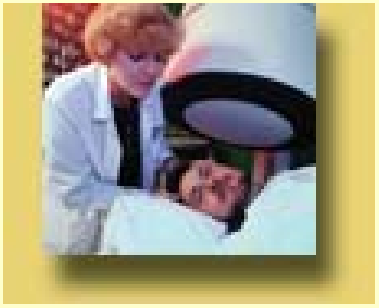
Outcome: Start up Iowa company: **BioSynthema to move to Iowa**

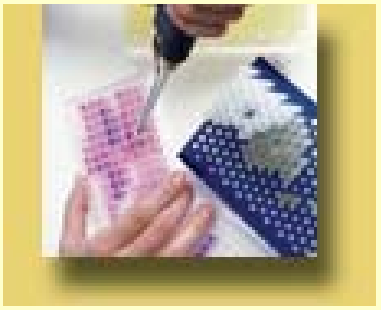
Title: New Antimycotics from Marine (micro)Organisms

Partners: Kemin Pharma, The University of Iowa and Iowa state University

Outcome: With more than 3 million cases per year in the US in 2000 with the current treatment **market estimated at $5B**

Battelle/BAI Platform: Drug Discovery and Development





Molecularly Targeted Radiopeptide Therapy for Cancer

This project will work to commercialize therapies that will target cancers such as melanoma, carcinoid, and prostate in adults as well as neuroblastoma and brain tumors in children.

This is a unique opportunity to move a biotech company (BioSynthema) to Iowa BioSynthema has the expertise to design and synthesize peptides for human therapeutic use.

Battelle/BAI Platform: Drug Discovery and Development

Leveraged Funding by Project

Diagnostics and Therapeutics Platform for Age-related Macular Degeneration

2006 - ~$1.25M NIH Federal funding
2006 - $1M private/venture investment funding

Molecularly Targeted Radiopeptide Therapy for Cancer

2006 - Combined funding of $100,000 from Novartis Pharmaceuticals, Inc., the University of Iowa Foundation, and UI Holden Comprehensive Cancer Center

New Antimycotics from Marine (micro)Organisms

2006 - Kemin, $350,000/yr for 3 years
UI, $50,000/yr for 3 years

Battelle/BAI Platform: Genomic Medicine

THE UNIVERSITY OF IOWA

IDT INTEGRATED DNA TECHNOLOGIES, INC.

Platform Co-Chairs

Industry Leader

Joe Walder, M.D., Ph.D.
CEO and President
Integrated DNA Technologies, Inc. (IDT)

Academic Leader

Val C. Sheffield, M.D., Ph.D.
Howard Hughes Investigator
Carver College of Medicine
University of Iowa

This platform will develop projects aimed at overcoming current obstacles to gene-directed therapy and medical care including:

- **Affordable, rapid genetic testing**
- **Identification of study participants**
- **Information management**
- **Availability of animal models**

Battelle/BAI Platform: Genomic Medicine

Potential Projects:

Title: Bioinformatics for the Study of Human Diseases

- **Partners**: Bio::Neos, The University of Iowa
- **Outcomes**: Expansion and development of Bio::Neos, a new Iowa based start-up.

Title: National Genetic Testing Laboratory for Inherited Eye Diseases

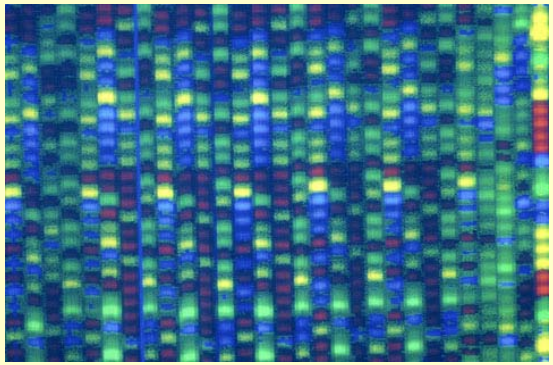
- **Partners**: Foundation Fighting Blindness and Alcon Laboratories (Fort Worth, TX), Bio::Neos, The University of Iowa
- **Outcomes**: Affordable, rapid genetic testing for all known inherited forms of blindness including age-related macular degeneration and glaucoma.

Title: High-Throughput Animal Model Facility

- **Partners**: Alcon Laboratories and Techspace, Inc. (Monona, IA), The University of Iowa
- **Outcomes**: Opportunity for expanded partnership with Foundation Fighting Blindness and Alcon Laboratories.

Battelle/BAI Platform: Genomic Medicine

Bioinformatics for the Study of Human Diseases



Industry Partner: Bio::Neos, Inc.

- Bioinformatics software company
- Spin-off from University of Iowa research

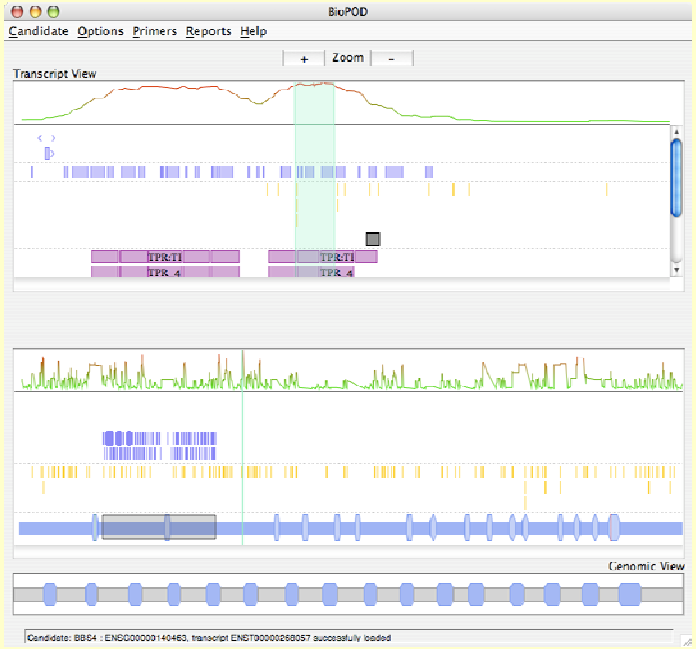
•Bio::Neos provides

- Commercial software derived from proof of concept work used in University of Iowa research
- A conduit for commercializing future software developed at The University of Iowa
  - Research labs do not have the resources to develop viable commercial grade software.

Platform: Bioinformatics for the Study of Human Diseases

Bio::Neos

- Potential ROI
- Bioinformatics Growth
  - New field, but increasingly important for the pharmaceutical industry
  - Possibility for large growth
- Bio::Neos solutions can be marketed globally
  - Large pharmaceuticals
  - Biotech research companies
  - Academic research groups
- Bioinformatics growth would complement other biotech growth throughout Iowa



Battelle/BAI Platform: Genomic Medicine

Leveraged Funding by Project

Bioinformatics for the Study of Human Diseases

2006 - NIH Federal funding
2006 - private/venture investment funding for Bio::Neos

National Genetic Testing Laboratory for Inherited Eye Diseases

2006 - NIH Federal Funding
2006 - Foundation Fighting BlindnessFoundation Fighting potentially match BAI's support up to a maximum of $400,000

High-Throughput Animal Model Facility

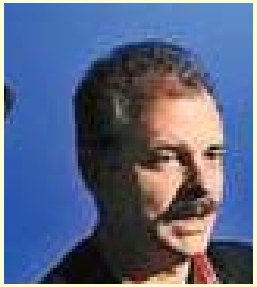
2006 - Alcon Laboratories, potentially match BAI's support up to a maximum of $400,000

Battelle/BAI Platform: Biomedical Imaging

THE UNIVERSITY OF IOWA

CIVCO MEDICAL INSTRUMENTS

Platform Co-Chairs



Industry Leader

Charles Klasson
CIVCO Medical
Kalona, IA

Academic Leader

Laurie Fajardo, M.D.
Chair, Dept. of Radiology
University of Iowa

- Academic and commercial imaging research and development in Iowa
- Leverage Iowa's technology leadership areas in imaging and allied disciplines
- Identify, define and prioritize infrastructure investment "portfolio" opportunities
- Attract capital, encourage/create "spin-off" companies → private sector jobs in Iowa
- Battelle Report: Imaging → niche opportunity

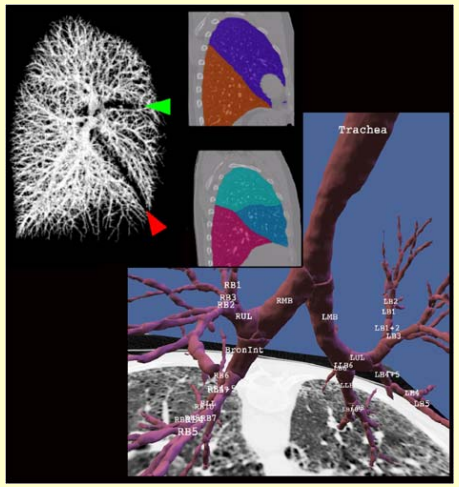
Battelle/BAI Platform: Biomedical Imaging

Isotopes for Cancer Imaging and Therapy

Partners: Pharmacy Services of the Quad Cities, The University of Iowa Department of Radiology, UIHC PET Imaging Center
Outcome: Develop a new company that specifically leverages existing infrastructure, faculty/staff resources, and technological innovations at The University of Iowa to produce, market and distribute essential and novel imaging radiopharmaceuticals for the diagnosis and treatment of cancer within the State of Iowa and nationally.

TITLE: Quantitative Imaging of Iowa (QI^2)

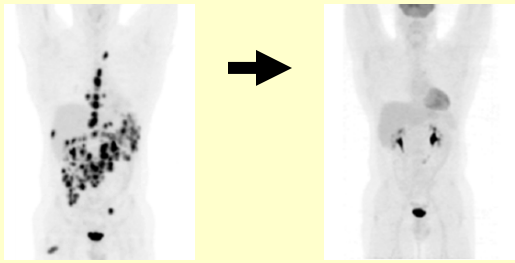
Proposed Partners: VIDA Diagnostics, Ferraris Respiratory, QI^2 (a spin-off company from members of The University of Iowa Colleges of Medicine and Engineering)
Outcome: This effort will establish a new company that will provide services which take advantage of medical imaging for outcomes and safety studies. The company will offer a comprehensive clinical trials service, linking existing and new start-up companies in the area of medical image analysis together with the UI, where significant core facilities and intellectual critical mass already exist for image data handling, quality control and image assessment. The initial focus will leverage Iowa's international leadership in lung imaging.



Battelle/BAI Platform: Biomedical Imaging

Isotopes for Cancer Imaging and Therapy

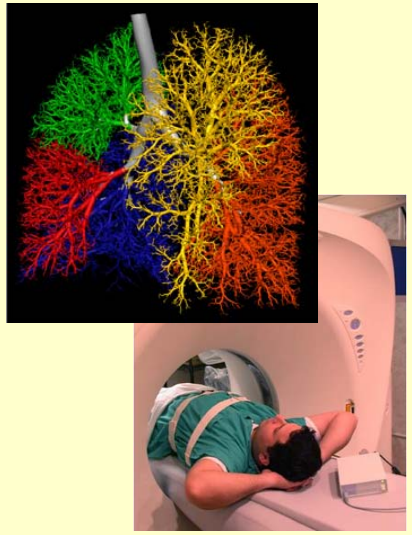
Initial funding request is to secure new radionuclide accelerator to be located in existing UIHC facilities. Create isotope handing facilities at Oakdale Research Park. Estimated initial new jobs is 5-7 at $50K salary range. Program to become self-sustaining within 3 years. Leverage production and processing through NCI preclinical grant ($150K/yr), $1M+ Federal Cancer Research, and PET Center operations ($2M/yr). Serve State of Iowa and national markets. Estimated growth at 10-15% per year.



Pre-therapy Imaging **Post-therapy Imaging**

Quantitative Imaging of Iowa (QI²)

Initial funding request is to develop the infrastructure including regulatory clearances, hardware for data storage and transmission, and to establish the links with international imaging centers of excellence with offices centered at Oakdale Research Park. Estimated initial new jobs is 5-10 new jobs at $50-250K salary range. Program to become self-sustaining within 3 years. Leverage: image processing expertise of VIDA Diagnostics, Pulmonary Function Testing and Core Labs expertise of Ferraris, and Clinical Trials and Imaging expertise of The University of Iowa along with $20M+ research dollars from the NIH.



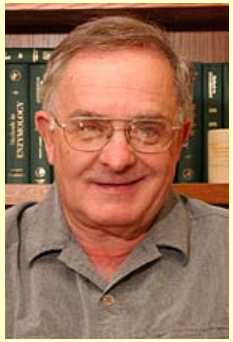
Battelle/BAI Platform: Biodefense

The University of Iowa

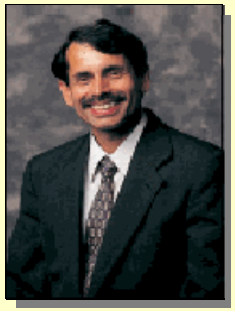
Institute for Food Safety & Security
Iowa State University

Global Vet Link
Official On-Line, eHealth Certificate System

Academic Co-Leaders



Michael Apicella, M.D.
Professor and Chair
Dept. of Microbiology
Carver College of Medicine University of Iowa



Manjit Misra, Ph.D.
Director, IFSS

Iowa State University

Industry Leader

Kevin Maher
President
Global Vet Link

Platform—The platform for biodefense will focus on deploying the strengths of Iowa's institutions in human, animal, and plant disease prevention, protection, and treatment to establish an integrated approach to securing the environment, food production systems, and human health and safety.

Iowa State Univesity – Battelle/BAI

We have seen outstanding progress for advancement of research and commercialization through collaboration of three universities and seven platforms. You will hear about several projects involving faculty and industry co-chairs for building infrastructure which will position us to obtain external funding from Federal agencies.

Iowa Center for Advanced Neurotoxicology

Neurotoxicology bridges the scientific fields of toxicology and neuroscience and can affect the health of humans and animals and significantly impact related industries, the economy and the environment

Existing Strengths

- Faculty – Dr. Anumantha Kanthasamy, Chair of the Eugene and Linda Lloyd Endowed Professor in Toxicology; Five additional faculty with NIH-funded research in neurodegenerative & neuropharmacology; expertise in diagnostic toxicology
- Sponsored Funding – More than $10 million in federal funding with the potential for much more
- Areas of Expertise – Parkinson's, pesticides & metals, parasitic worms, "Mad Cow" disease

Information Sciences Institute

The new Information Sciences Institute – **the third Battelle objective –** will bring together four of Iowa State's existing centers. Each of these centers has a different emphasis in the general area of information science and technology. Bringing them together will facilitate collaboration and the ability to increase external funding and seek greater activities in commercialization.

Four Centers:

- Information Infrastructure Institute - Somani & Kothari
- Human-Computer Interaction (HCI) – Oliver
- Computational Intelligence, Learning & Discovery (CILD) – Honavar
- Computer Security - Jacobson

Battelle/BAI Platform: Advanced Food and Feed

Platform Co-Chairs

Michael O. Budnick
Executive Vice Pres
Sales, Mkt & Bus Dev
Proliant Health and Biologicals

Ruth S. MacDonald, RD PhD
Professor and Chair
Food Science and Human Nutrition
Iowa State University

This platform will create a public/private collaboration to develop and evaluate novel food and feed products with health promoting benefits to enhance the value of Iowa-grown commodities and ingredients. A Nutrition and Wellness Research Center is under development which will be the focal point of this platform.

Battelle/BAI Platform: Advanced Food and Feed

Potential Projects:

Commercial Food Product Development Pilot Plant

Partners: Food industry, commodity groups (soybean, corn, dairy, meat, egg), ingredient processors

Outcome: Create incubator environment to commercialize foods that promote health

Commercial Animal Feed Development Pilot Plant

Partners: Farm and agricultural-based industry, feed processors

Outcome: Create and incubator environment to commercialize use of waste agricultural products for animal feed

IOWA IS…..

- **1st in Soybean production**
- **1st in Egg production**
- **1st in Corn production**
- **1st in Hog production**
- **2nd in Red Meat production**

Battelle/BAI Platform: Advanced Food and Feed

Potential Projects:

Facts:

- **680 food companies in Iowa**
- **51,000 employed in food related industry**
- **$4 billion from food industry in Iowa GSP**

Commercial Food Development Pilot Plant

This project will

- facilitate the transfer of novel food products from the invention/discovery phase to commercialization.
- expand the food production capacity in Iowa and create employment opportunities in food production.

GOAL: To double the number food related industries in Iowa by 2010

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GOAL: To double the number food related industries in Iowa by 2010

Battelle/BAI Platform: Advanced Food and Feed

The AFF platform received funding to create the Nutrition and Wellness Research Center through the first phase of BAI funding. The Center will be the focal point for commercial food and ingredient development **for health promotion.**

Commercial Food Development will create the **technology transfer environment** to establish markets for the foods and ingredients developed by the Center and its partners.

Research funds from NIH, USDA and the private sector will be obtained and industry partners will contribute to facilitate new product development.

Facts:

- **Healthy food marketing is the fastest growing worldwide**
- **Chronic diseases (obesity, diabetes, heart disease) raise health care costs and decrease productivity**

GOAL: To make Iowa the HEALTHY FOOD CAPITAL of the USA

Battelle/BAI Platform: Advanced Food and Feed

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GOAL: To make Iowa the HEALTHY FOOD CAPITAL of the USA

Battelle/BAI Platform: Animal Systems

Platform Co-Chairs

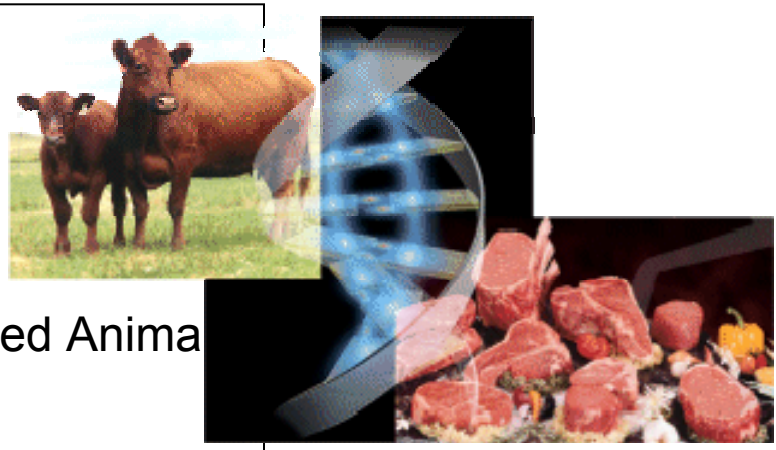
Industry Leader
Jan Schuiteman
CEO,
Trans Ova Genetics
Sioux City

Academic Leader
Max F. Rothschild, PhD
Distinguished Professor
Director, Center for
Integrated Animal
Genomics
Iowa State University

This platform will create collaboration between public and private research by working with industrial and university scientists to develop and promote new animal and human products, increased value of livestock, improved human and animal health for the benefit of Iowa.

Battelle/BAI Platform: Animal Systems

Potential Projects (examples of 2):



Title: Integrated Animal Genomics for Agriculture and Biomedicine

Partners: Trans Ova, Sioux Center
Integrated DNA Technologies, Coralville
Iowa State University Center for Integrated Anima Genomics
University of Iowa, School of Medicine

Outcome: 2 Start up Iowa Companies
Iowa Genomics Labs, LLC, RepGenix, LLC

Title: Midwest Research Consortia for Ethanol Plant By-product Utilization by Intensively-Reared Aquaculture Animals

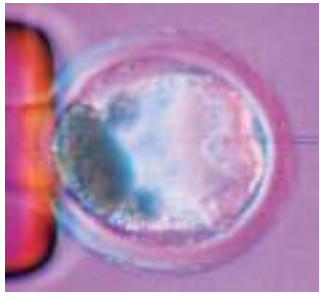
Partners: Ag Ventures Alliance, Mason City
Midwest Grain Processors, Lakota,
ISU Department of Animal Science
University of Northern Iowa,

Outcome: New industry to partner with Ethanol production, increase sustainability and new cash enterprise

Battelle/BAI Platform: Animal Systems

Potential Projects

Integrated Animal Genomics for Agriculture and Biomedicine



- This project will develop biomedical models for cystic fibrosis and other human disease which will improve human health. Furthermore, high throughput genotyping can be used to select for genetically improved livestock. These synergistic efforts will lead to the development of products to improve the biomedical and animal industries.
- **This is a unique opportunity to develop 2 start-up companies:** a high-throughput genotyping company (IOWA Labs, LLC) and a high-throughput gene targeting company (RepGenix, LLC). These could partner with existing biotech companies including IDT and Trans Ova.

Battelle/BAI Platform: Animal Systems

Job Creation and Retention

The animal industries in Iowa represent the largest single enterprise in the State with more than 75,000 jobs and more than $11 billion in GNP in the Iowa. Maintaining, improving and modernizing these industries and developing new products will mean real job growth of at least 5,000 jobs.

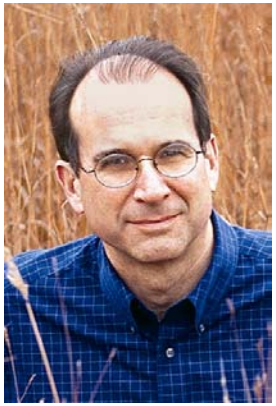
These jobs will be to help develop:

- Disease Resistance, Prevention and production enhancement
- Tailored Genomics for Niche Markets and Integrated Animal Production Systems
- Trace Back, Quality Systems and Diagnostics
- Improved Food Safety and Biosecurity
- Pharmaceutical, Bio-Defense, and Nutraceutical Products from Animals
- Medical Devices and Human Tissue Transplants from Animals

Research funds from NIH, USDA and the private sector will be obtained and industry partners will contribute to facilitate commercialization.

Bioeconomy Platform

Georg Anderl, Director of Operations for Market Development, Genencor



Robert C. Brown, Bergles Professor of Thermal Sciences, Director of the Office of Biorenewables Programs, Iowa State University

- Focus - Build the intellectual foundation and the industry/ academic collaborations to support the emergence of biorefineries in the state of Iowa
- Keys to attracting biobased industries to Iowa
  - Convince them that Iowa has the intellectual resources to develop new technologies for this industry
  - Demonstrate that Iowa can assist them in the decision-making process of how to build commercially successful enterprises

Bioeconomy Platform

- **Chemicals From Carbohydrates and Oleochemicals:** State funds will leverage National Science Foundation funds for creation of a Center for Biorenewables Chemicals (infrastructure, equipment, and student support)

- **Thermochemical Technologies for Biorefineries:** Research to support evolution of ethanol plants into integrated biorefineries (infrastructure, equipment, and staff support)

- **Decision Making and Investment for Biobased Businesses:** Establish a business-oriented center to address the human capital, business, marketing, policy, and infrastructure issues of this industry (faculty and graduate student support)

Bioeconomy Platform: Project

- **Center for Biorenewable Chemicals**
  - Carbohydrates (starch and cellulose) and oleochemicals (fats and oils) are the building blocks of the bioeconomy
  - Aim is to improve biofuels and develop additional products: adhesives, detergents, dielectric fluids, hydraulic fluids, inks, lubricants, packaging materials, paints, polymers, and solvents, among others.
  - Funds will be used for laboratory equipment and professional and scientific staff for labs and administrative support (leverage National Science Foundation funds).
  - Potential industry partners include BIOWA, Cargill, Genencor, ICM, Monsanto, Pioneer, West Central Coop, Iowa ethanol producers

Bioeconomy Platform: Impact

- *Today's* Economic Impact
  - Job Creation (last five years): **5,400**
  - Total Sales (2005): **$3.4 billion**

- *Future* Economic Impact
  - Job Creation[1]: **13,500 (next 5 years); 81,000 (next 20 years)**
  - Total Sales[2]: **$6.25 billion (2010); $51 billion (2025)**
  - Rural development: Manufacturing distributed in counties where biorenewable resources are grown
  - Global Climate Change[3]: Additional producer income through carbon sequestration ($50 - $100/acre)

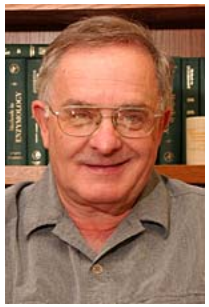
1. Based on projected growth of renewable fuels expanding from current 2% of U.S. transportation fuels to 5% transportation fuels in five years
2. Based on DOE goal for 30% renewable transportation fuels by 2025
3. Based on proposed pyrolytic char sequestration in soils under development at ISU

Battelle/BAI Platform: BioSecurity

Platform Co-Chairs:

Academic Co-Leaders:

Dr. Manjit Misra, Director
Institute for Food Safety and Security
Iowa State University



Dr. Michael Apicella, Head
Department of Microbiology, College of Medicine
University of Iowa

Industry Leader:

Kevin Maher, President
GlobalVetLink
Ames, Iowa

This Platform will:

Protect plant, animal, and human health from deliberate or natural threats to assure continued economic security and growth in Iowa.

Proposed Projects:

- **Diagnostics and Vaccines Development for controlling Influenza in Production Animals**
- **Nanotechnology Sensors for Plant and Animal Biosecurity**
- **High Throughput Natural Antimicrobial and Prebiotic Discovery Facility for Food Safety and Security**

Battelle/BAI Platform: BioSecurity

Diagnostics and Vaccines Development for Controlling Influenza in Production Animals

Corporate Partners: **1) TechSpace, Inc., Monona, Iowa 2) Fort Dodge Animal Health of Fort Dodge 3) Boehringer Ingelheim VetMedica of Ames**

Other Partners: **University of Iowa's College of Public Health, National Animal Disease Center, Ames, IA**

Activity: Proactive measures to find and stop influenza in animal populations before it has the opportunity to infect humans. Accurate and rapid detection combined with control measures is essential to protect economic vitality of our industry and exports.

Impact: Iowa leads the nation in the production of pork and eggs. Even the perception that avian influenza is present in Iowa could bring *severe economic losses* to the state**.** The next influenza pandemic in the U.S. alone could cause up to 200,000 deaths, 314,000-734,000 hospitalizations, 38-89 million sick people and cost up to $166 billion.

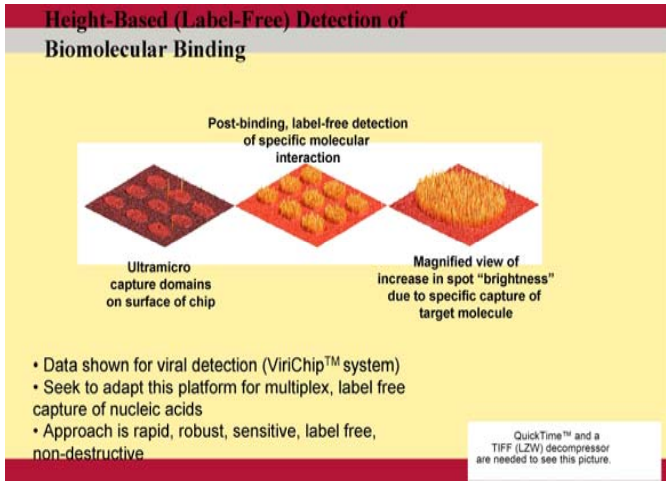
Battelle/BAI Platform: BioSecurity

Nanotechnology Sensors for Plant and Animal Biosecurity

Project Leader: Dr. Byron Brehm-Stecher, Iowa State University
Corporate Partner: BioForce Nanosciences, Inc.

Activity: Develop a sensitive & universal diagnostic platform for the detection of bacterial, fungal, or viral pathogens. Provide new tools for the rapid, multiplexed and label-free detection of specific nucleic acid sequences to be of use not only to food & agricultural industries but also in medical & environmental diagnostics & to biotechnology & biodefense sectors.

Impact: The work will leverage BioForce Nanosciences, Inc.'s unique technology (NanoArrayer™ uses atomic force microscopy (AFM) for the precise deposition of biological molecules on surfaces) for new sensor applications and will generate new and licensable intellectual property



New service to Iowa – opportunity to start new business in Iowa with the potential to be a leader in nanotechnology-based sensor development.

Battelle/BAI Platform: BioSecurity

High Throughput Natural Antimicrobial and Prebiotic Discovery Facility for Food Safety and Security

Dr. Anthony L. Pometti III
Project Leader

Other Partners: 7 other institutions:
University of Massachusetts, Alabama A&M, Texas A&M, Northern Caribbean Univ., Seoul National University, University of Wyoming, Technology Solutions, Ltd., Kingston, Jamaica

Activity: Discover and commercialize naturally occurring bioactive compounds from plant and animal sources that will inhibit pathogens in or on food matrices and/or stimulate probiotic growth to improve the health of humans and livestock

Impact:
Commercial Impact: $1billion+ by:
- Pre-harvest pathogen control: *Listeria, E. coli,* and *Salmonella*
- Operating a Discovery Facility will attract federal and commercial research funding
- Discovery Facility will provide new service to Iowa with potential of attracting many commercial partners

KEMIN
Corporate Partner

University of Northern Iowa

Platform Support and Participation

Future Platform Participation

Support for Battelle Recommendations

- Workforce Development
- Applied Research
- Economic Development

Platform Support and Participation

Bioeconomy Platform

- Biorefinery Project – Collaborator
- NABL – Support for Biobased Lubricants
- Future Project - Center for Advanced Biobased Binders

Advanced Food and Feed

- Wellness Center Project - Collaborator

Future Platform Support and Participation

Examples of Potential Platform Projects

Biodefense Platform

- Anthrax Detection

Medical Devices

- Prosthesis Design (with Iowa Company)

Support for Battelle Recommendations

Workforce Support

- Biotechnology Program/Professional Science Masters

Applied Research Projects – Next Stage of GIVF Projects

- 8 Early Stage Research Projects with Potential for Commercialization and Collaboration in Future Platform Initiatives

Economic Development

- Linking Local Development to BAI and Advanced Manufacturing – Information Solution